

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
10 February 2005 (10.02.2005)

PCT

(10) International Publication Number
WO 2005/012925 A2

- (51) International Patent Classification⁷: **G01R**
- (21) International Application Number:
PCT/US2004/019695
- (22) International Filing Date: 18 June 2004 (18.06.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/479,687 19 June 2003 (19.06.2003) US
- (71) Applicant (for all designated States except US): **STRATEGIC CAPITAL NETWORK LLC [US/US]**; 800 Boylston Street, 24th Floor, Boston, MA 02199 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **HUNTER, Brian, A. [US/US]**; 359 Beacon Street, Boston, MA 02116 (US).
- (74) Agent: **NELSON, Gordon, E.**; 57 Central St., P.O. Box 782, Rowley, MA 01969 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

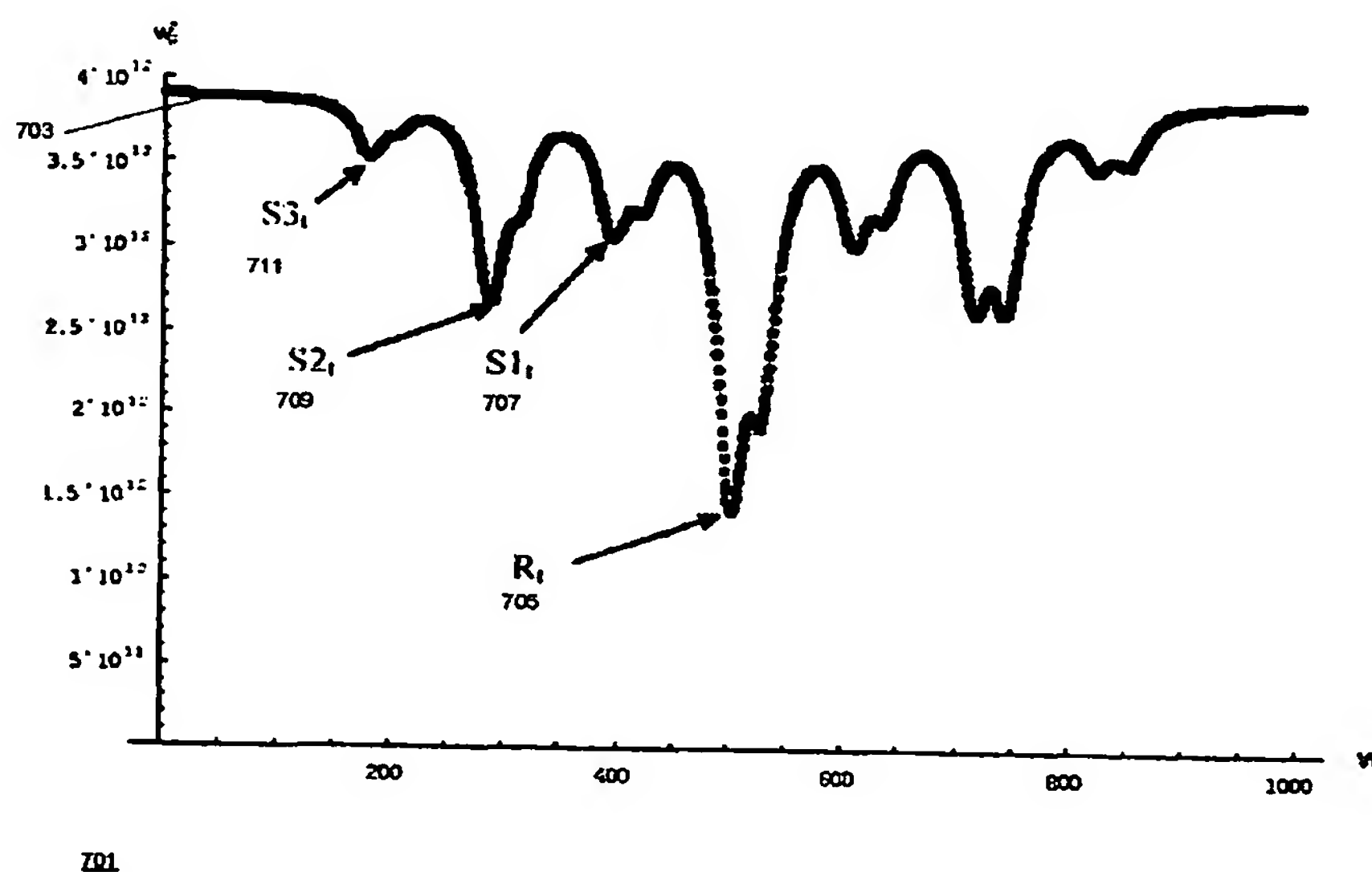
— of inventorship (Rule 4.17(iv)) for US only

Published:

— without international search report and to be republished upon receipt of that report

[Continued on next page]

(54) Title: DETERMINING AND SETTING THE FREQUENCY MODULATION INDEX OF A LASER IN A CPT FREQUENCY STANDARD



(57) Abstract: A technique for determining the modulation index of a frequency-modulated laser source from the absorption spectrum that is produced when light from the laser passes through an alkali metal vapor cell. The absorption spectrum contains a primary minimum and a number of satellite minima and the modulation index is determined using ratios of the minima. The technique is used to calibrate the laser source of a CPT frequency standard so that it operates at a desired modulation index. Ways are disclosed of using the technique to calibrate the CPT frequency standard either manually or automatically. The calibration may be done when the CPT frequency standard is built, when the frequency standard is initialized, or during normal operation of the CPT frequency standard.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
10 February 2005 (10.02.2005)

PCT

(10) International Publication Number
WO 2005/012925 A3

(51) International Patent Classification⁷: H01S 1/06, 3/10, 3/13, H02L 7/26, H03B 17/00, G01P 3/36, G02B 27/32

(21) International Application Number:
PCT/US2004/019695

(22) International Filing Date: 18 June 2004 (18.06.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/479,687 19 June 2003 (19.06.2003) US

(71) Applicant (for all designated States except US): STRATEGIC CAPITAL NETWORK LLC [US/US]; 800 Boylston Street, 24th Floor, Boston, MA 02199 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): HUNTER, Brian, A. [US/US]; 359 Beacon Street, Boston, MA 02116 (US).

(74) Agent: NELSON, Gordon, E.; 57 Central St., P.O. Box 782, Rowley, MA 01969 (US).

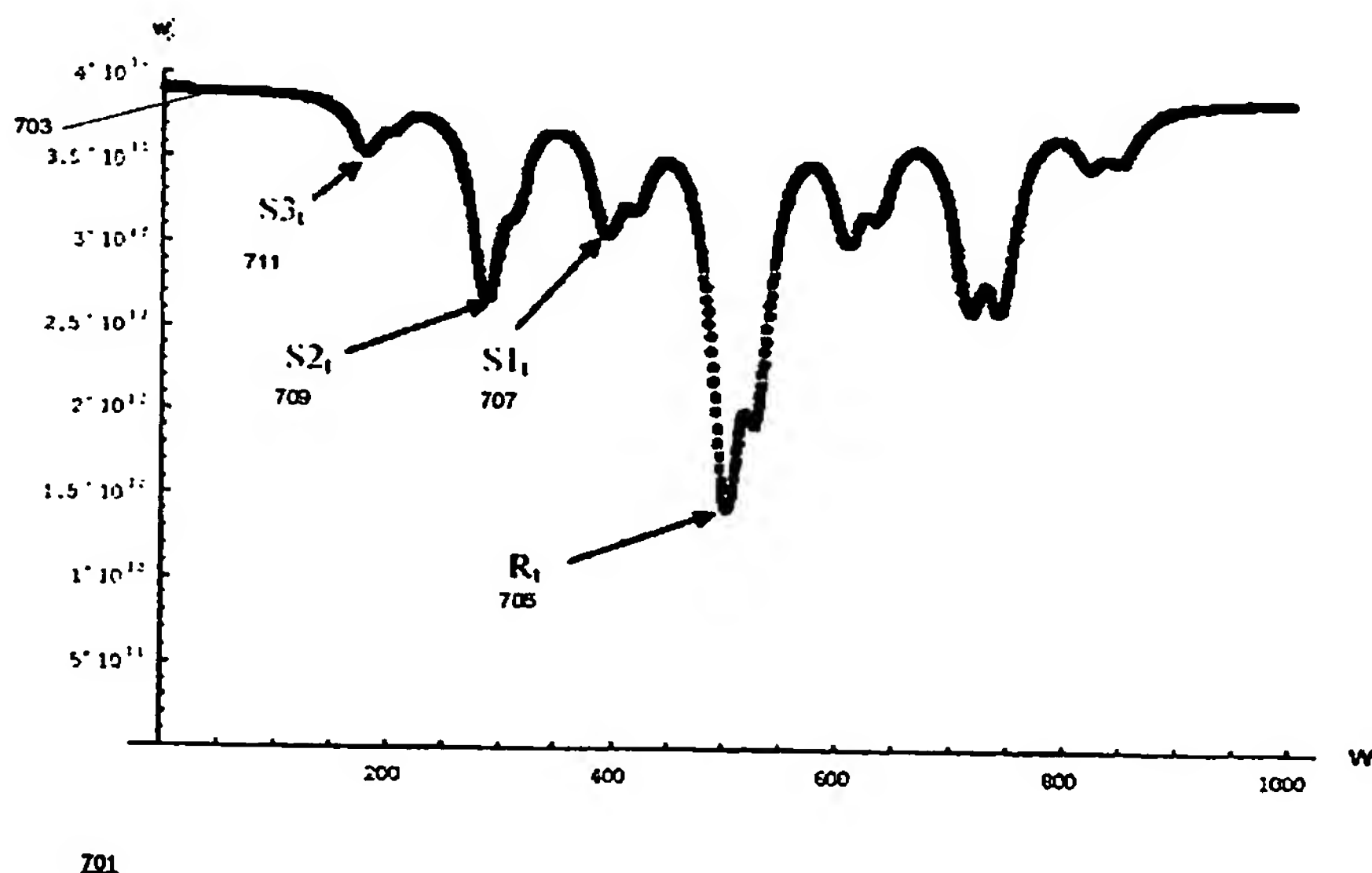
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— of inventorship (Rule 4.17(iv)) for US only

[Continued on next page]

(54) Title: DETERMINING AND SETTING THE FREQUENCY MODULATION INDEX OF A LASER IN A CPT FREQUENCY STANDARD



(57) Abstract: A technique for determining the modulation index of a frequency-modulated laser source from the absorption spectrum that is produced when light from the laser passes through an alkali metal vapor cell. The absorption spectrum contains a primary minimum and a number of satellite minima and the modulation index is determined using ratios of the minima. The technique is used to calibrate the laser source of a CPT frequency standard so that it operates at a desired modulation index. Ways are disclosed of using the technique to calibrate the CPT frequency standard either manually or automatically. The calibration may be done when the CPT frequency standard is built, when the frequency standard is initialized, or during normal operation of the CPT frequency standard.

WO 2005/012925 A3



Published:

— with international search report

(88) Date of publication of the international search report:
26 May 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.